

• COLORADO RIVER •
AQUEDUCT NEWS

THE METROPOLITAN WATER DISTRICT



OF SOUTHERN CALIFORNIA

Vol. II

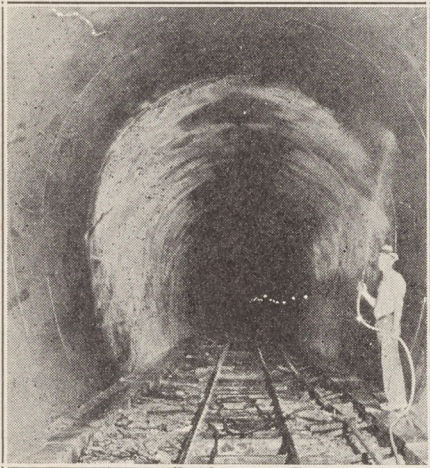
JANUARY 5, 1935

No. 1



JUNIOR JUMBO AT BERNASCONI
(See Page 8)

/ AQUEDUCT HIGHLIGHTS OF 1934 /



MONTH BY MONTH

Jan. 7—First aqueduct concrete poured at Fan Hill siphon.

Feb. 2—Work started on the remaining 7.19 miles of Coachella tunnels.

Mar. 20—Thousand Palms Tunnel No. 2 holed through.

April—Final conferences on Parker Dam specifications held by M. W. D. and Reclamation Bureau officials.

May 27—Morris Dam dedicated.

June 1—Little Morongo Camp completed.

July 4—One-third mark in tunnel excavation reached.

Aug. 11—Morrison-Knudsen's Mecca Pass Tunnel No. 2 holed through.

Sept. 4—Reclamation Bureau and Six Companies sign Parker Dam contract.

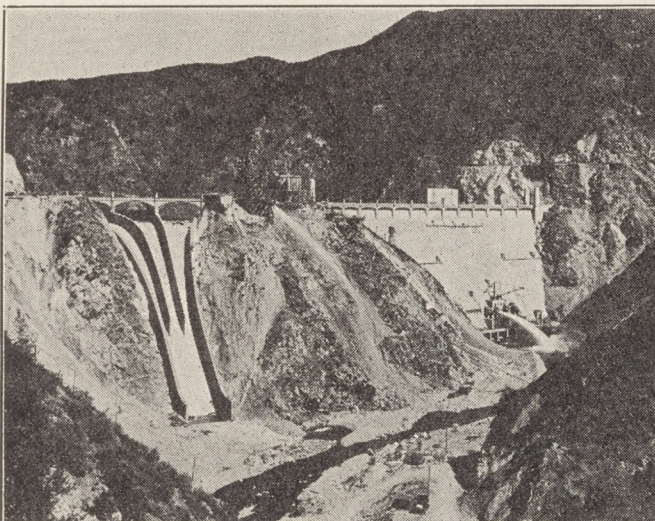
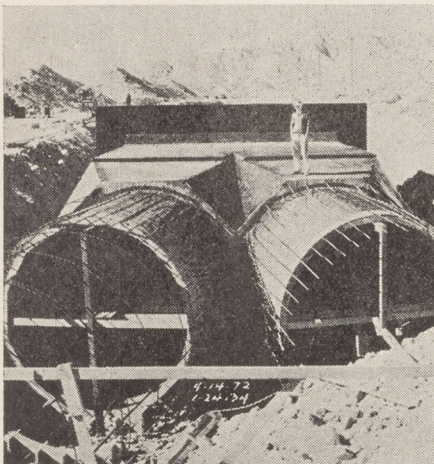
Oct. 11—First aqueduct siphon, conduit, canal bids received.

Nov. 1—Coachella tunnels pass 100,000-foot mark.

Dec. 7—Contracts for 5,000,000 barrels of cement awarded.



Upper left—First aqueduct tunnel lining at Morrison-Knudsen's Mecca Pass job. Center left—Fan Hill siphon work starts. Lower left—Pine Canyon dam completed. Upper right—Bob Banovich and Charley Carlson of Wide Canyon, winners of the aqueduct drilling contest. Lower right—Walsh Construction Company crews hole through east portal of Copper Basin No. 2.



CONSTRUCTION PLANS FOR POWER SYSTEM FROM BOULDER ARE OUTLINED BY J. M. GAYLORD

The design of the Boulder Dam transmission system for the aqueduct presents very interesting special problems which differ materially from those problems ordinarily involved in the design of a commercial power system. One of the most important factors is the relative unimportance of reliability in the pumping system. The aqueduct will be so well provided with terminal water storage and also storage at various points along the line that an interruption of several hours or even several days in the pumping of water will interfere very little with the delivery of the desired amount of water even under the conditions of full development many years in the future. The reliability of any reasonably well built transmission system is so great in comparison with this requirement that the question of momentary interruptions of power due to lightning flashovers or other ordinary causes may be practically neglected. Careful consideration was given to this question in an effort to determine just how much an interruption of power would cost the District at various stages of the development program of the aqueduct.

Interruption Cost

Consideration was given to the cost of pumping water which might be spilled on the desert during an interruption and even to the probable cost of replacing such water under the ultimate conditions when the full capacity of the aqueduct would be required for supplying the demands of the District cities. It was found that the present value of the loss due to one interruption per year amounted, for a 50-year period, to \$5000. In other words, \$5000 placed at interest at the present time would pay all of the costs which would result from one interruption per year for 50 years. This is the maximum expenditure which could be justified at the present time to prevent one interruption per year. This figure was used in considering the advisability of installing duplicate lines, overhead ground wires, counterpoises and other refinements designed to prevent interruptions of service. The unimportance of service reliability also makes it possible to operate closer to the power limit of the system than would be the case with a commercial system.

The transmission system will take the form of an inverted Y with a main line

By J. M. GAYLORD,
*Chief Electrical Engineer,
Metropolitan Water District*

EDITOR'S NOTE: Since the building of the District's transmission lines from Boulder Dam will be one of the important phases of construction launched during 1935, it is felt that the accompanying authoritative information on the subject will be of great general interest. It consists of excerpts from a paper presented by Mr. Gaylord before the American Institute of Electrical Engineers, Los Angeles Section.

running from Boulder Dam south to a point on the State Highway near Goffs and branches from that point southeast to Parker Dam and southwest to Iron, Eagle and Hayfield pumping plants.

Voltage Studied

The determination of the voltage for this system was given very thorough consideration. The studies included 287,000, 230,000 and 161,000 volt systems, using various numbers and combinations of lines, both in the main trunk of the system and in its branches. For each voltage considered, studies were made to determine the most economical number of lines and size of conductors, and a final comparison was made among the most economical designs for each of the voltages considered. This study was complicated by the fact that the development of the aqueduct in all its phases is expected to extend over a development period of 40 to 50 years before full capacity is attained. During this development period the growth of the power demand will increase by steps as additional water is needed and additional pumps are installed. Some of the systems considered are better adapted than others to such a gradual development in the power requirements. In each case this development program was considered and a figure obtained which represented the present worth of all expenditures for construction, operation, maintenance, depreciation and power losses of the system under consideration. This present worth is the amount of money which, if

invested today, would provide funds for the construction and operation of the system under construction for the full period of 50 years.

Having determined 230,000 as the voltage of transmission, the next problem was the design of the supporting structures. During the last few years there has been much talk and some actual use of wooden structures for supporting high voltage transmission circuits. The use of wood was considered for the District lines, but the climatic conditions of the desert were considered very unfavorable to this type of construction. The extremely hot, dry summers and bright sunlight causes warping, cracking, and general deterioration of all wooden structures exposed to desert conditions. Wooden poles are frequently shattered by lightning strokes, and lightning storms are much more frequent on the desert than along the Coast.

Wood vs. Steel

One of the principal arguments in favor of wood is its lower cost, but considering its shortcomings and its shorter life, we believe that there is very little difference in the ultimate costs between steel and wooden structures for the District's lines. Steel has, therefore, been adopted as the material for the transmission towers.

There are, of course, several types of steel towers worthy of consideration for this line. The conventional rigid tower with four legs has been used extensively in the West. The flexible type with reduced strength longitudinally along the line has been used in a number of cases in the East. Midway between the rigid and flexible types is the post type usually consisting of H-frame structures guyed longitudinally and transversely. The flexible and semi-flexible types, while cheaper than the rigid towers, are not as strong, and in considering all of these designs it becomes apparent that the cost of each type of structure is a good indication of its strength and general desirability. Even the flexible type loses much of the advantage of lower cost when designed to carry high ground wires. It is possible that it may be found advisable to add overhead ground wires to the line for lightning protection even though these are not included in the original construction.

(To Be Continued.)

COLORADO RIVER
AQUEDUCT NEWS
 THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

LOS ANGELES, CALIFORNIA

Published twice monthly in the interest of Field and Office Workers on the Colorado River Aqueduct, and for the information of all other citizens of the Metropolitan Water District.

Vol. II January 5, 1935 No. 1

Safety On the Aqueduct

CABAZON TEAM ENTERTAINED

Wenzel & Henoch Construction Company recently entertained the championship Cabazon first-aid team at dinner at Lucca's in Los Angeles as a compliment to the showing made in the Red Cross first-aid contest.

EAGLE MT. SAFETY MINUTES

Minutes of a recent meeting of the Broderick & Gordon safety committee contained the following record of business which may be of some interest and value to other committees confronted with much the same problems:

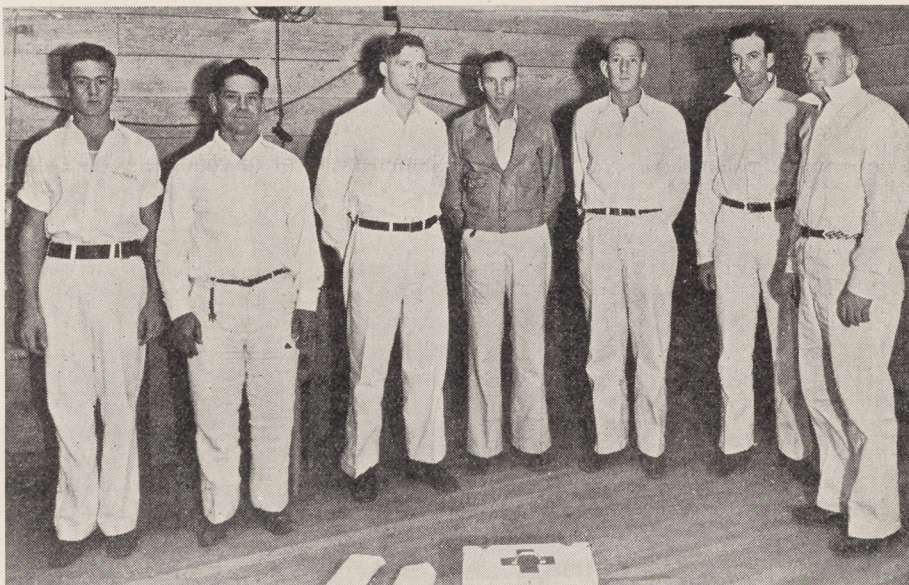
"Ralph Perkins suggested taking the powder into the headings just previous to loading, thus eliminating any undue hazard. He also commented on the fact that every suggestion brought up in the November meeting has been carried out. George Rood reported that he had been asked to build a step on the muck cars where the brakeman stands, but as the cars are closely coupled it was decided that this would be a greater hazard than now exists. Mr. Perkins questioned the advisability of allowing the mucking machine operators to run the locomotives, but in as much as these men have all had several years of experience under ground, the committee felt it was safe to allow this practice. Superintendent C. J. Kavanagh brought up the matter of getting all the men far enough back from the heading when firing a round. There have been a few accidents of this nature and it is to be the duty of each shift boss to be certain that all men are back of the firing switch."

CABAZON FIRST AID TEAM WINS TOP HONORS AT L. A. RED CROSS CONTEST



Here is the Wenzel & Henoch Cabazon first-aid team which won the championship gold trophy and a permanent loving cup in the First-Aid Contest held by the American Red Cross Society in Los Angeles. Each member of the team also was awarded a medal and a Red Cross certificate. Personnel of the championship organization is as follows (left to right): Safety Engineer S. M. Jarrett, Superintendent W. A. Boyd, Team Judge Lee Pierano, Captain H. Sube, M. Sesonday, M. McGovern, J. Bird, C. M. Browner, A. B. Cook and R. A. Boyd.

LONG CANYON TEAM DEMONSTRATES



And here is the pioneer first-aid team of the Coachella Division of the aqueduct, the Long Canyon crew which gave a demonstration at the recent safety rally meeting at Berdoo. Long Canyon was the first camp to organize a first-aid team. From left to right the men shown above are J. K. West, C. M. Hatfield, M. A. Anderson, V. L. Bland (team judge and instructor), M. E. Sullivan, E. L. Blevins, R. B. Arrowsmith.

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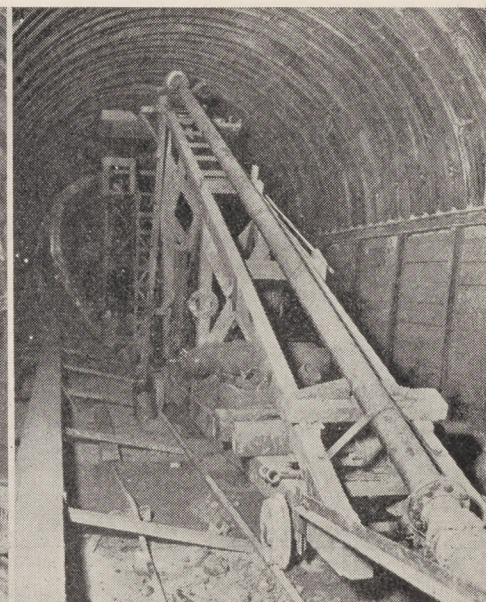
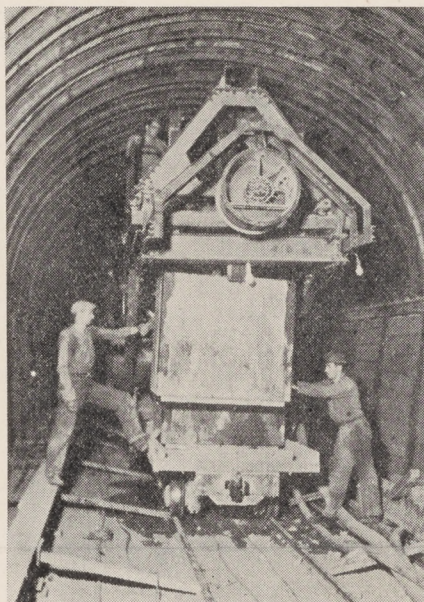
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Division 1.....R. C. Booth
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 Division 3.....John Stearns
 Division 4.....B. C. Leadbetter
 Divisions 5 and 6.....J. B. Bond

SUPERINTENDENTS

Colorado River, Copper Basin and Whipple Mt. Tunnels, Walsh Construction Co., F. T. Huntington, Gen. Supt.; W. A. Huntington and Jack Lamey, Tunnel Supts.
 Coxcomb Tunnel and Iron Mt. shaft, Winston Bros., E. A. Bernard, Gen. Supt.; F. T. Hillman and R. B. Johnson, Tunnel Supts.
 Iron Mt. Tunnel, West Portal, Utah Constr. Co., Ben Arp, Gen. Supt.
 East Eagle Mt. Tunnel and West Eagle Mt. Tunnel, east portion, Broderick & Gordon, C. J. Kavanagh, Gen. Supt.
 West Eagle Mt. Tunnel, west portion, L. E. Dixon and Bent Bros. P. C. Guinn, Gen. Supt.
 Hayfield Tunnel No. 1, Hunkin & Conkey Constr. Co., G. B. Hoag, Gen. Supt.; F. Backlund, Tunnel Supt.
 Hayfield Tunnel No. 2, Shofner & Gordon, H. E. Warden, Gen. Supt.
 Cottonwood Tunnel, J. F. Shea Co., Inc., Gilbert Shea, Gen. Mgr.; Joe Bonner and Carl Nelson, Tunnel Supts.
 Mecca Pass Tunnels, Morrison-Knudsen, George Fortier, Gen. Supt.
 Coachella Division, R. M. Merriman, Division Supt.
 Yellow Canyon Adit, E. Coachella Tunnel—District Force Account.....W. L. Taylor
 Fargo Adit, East Coachella Tunnel—District Force Account.....J. H. Manwaring
 Berdoo Adit, East Coachella Tunnel—District Force Account.....F. A. Weller
 Pushawalla Adit, East Coachella Tunnel—District Force Account, Kenneth MacIsaac
 Thousand Palms—District Force Account.....D. L. Reaburn
 Wide Canyon—District Force Account.....John Jackman
 Long Canyon—District Force Account.....E. E. McCabe
 Little Morongo—District Force Account.....R. L. Bryant
 Whitewater Tunnels, West Constr. Co., H. E. Carleton, Gen. Supt.; Angus MacDonnell, Tunnel Supt.
 San Jacinto Tunnel, Wenzel & Henoch, Walter Hoenecke, Gen. Supt.; W. A. Boyd, Walter Baer, and Jack May, Tunnel Supts.
 Bernasconi Tunnel, Hamilton & Gleason Co., H. J. King, Gen. Supt.
 Valverde Tunnel, Dravo Contr. Co., R. W. Remp, Gen. Supt.; H. C. Richardson, Asst. Gen. Supt.; Dean Luther, J. R. Glaeser, Jack Stone, and Fred Youmans, Tunnel Supts.



Concreting operations get under way in Whitewater No. 2. On the left is a hopper, full of dry mix concrete, being lifted for transportation to the mixer. The picture on the right shows the pressure pipe from the concrete gun to the forms.

New Records Made On Boulder Project

The New Year finds the aqueduct's sister project, Boulder Dam, breaking more records for construction speed, according to reports received last week from Boulder City.

Six Companies crews, working under the direction of Superintendent Frank Crowe, already have passed the 3,000,000-cubic yard mark in pouring concrete, and the giant structure looms up in the canyon with the appearance of a finished piece of work.

With specifications calling for the commencement of concreting on December 1, 1934, the job is now so far ahead of schedule that only a few more weeks of this activity remain. The first bucketful was poured not on December 1, 1934, but on June 6, 1933. The dam was supposed to require 975 days to finish. Indications now are that the actual time consumed will be less than 600 days.

Walker R. Young, United States Bureau of Reclamation construction engineer on the project, expects to begin storing water back of the dam within a few weeks. If there is a normal runoff from the Colorado watershed this year, Mr. Young predicts that there will be a lake formed more than 90 miles long, over 300 feet deep at the dam, and containing more than ten million acre feet of water.

Aqueduct Float Is Feature of Parade

Winner in the Municipal Division of the spectacular Tournament of Roses parade in Pasadena on New Year's Day was a colorful float entered by the Metropolitan Water District, depicting the Colorado River Aqueduct and built around the legend of the Seven Cities of Cibola and the River of Destiny (the Colorado River).

At the rear of the float rose a miniature mountain and canyon section of the Colorado River decorated with pompoms, sweet peas, hether, anemones and snapdragons. Blue delphinium marked the river through the canyon and over the flower and cactus-covered desert.

Near the front of the float rose snow-covered San Jacinto Mountain, one of the many mountain barriers through which 92 miles of aqueduct tunnels are being driven. The aqueduct tunnel section through Mount San Jacinto was shown flower-lined with the aqueduct water, represented by blue delphinium, rushing through and flowing down over the front of the float with the words "The River of Destiny" on it. On one side a field, with two little girls with flower-covered baskets playing among the poppies, sloped up to the foothills. On the other side were roses, violets, ranunculuses, anemones and fern. The mountain was covered with heather and white pompoms.

BEST PROGRESS**This Period**

6 day week: 7 Palms West, 807 ft.
7 day week: Copper Basin No. 2, 937 ft.

TUNNEL PROGRESS

Dec. 1 to 31, 1934

Tunnel Excavated to Date, 56.10 Miles

BEST WEEK'S PROGRESS**This Year**

6 day week: 7 Palms West, 241 ft.
7 day week: Copper Basin No. 2, 284 ft.

TUNNELS ON CONTRACT	Length in feet	Number of Shifts	EXCAVATION PROGRESS IN FEET		
			Average Per Shift	This Period	Total to date
Walsh Constr. Co. COLORADO RIVER West Portal	(5546) 5546	66	10.7	703	5546
COPPER BASIN, No. 1 West Portal	(752) 752			0	752
COPPER BASIN, No. 2 East from adit	(11,568) 1878			0	1878
Adit	330			0	330
West from adit	9690	76	12.3	937	9690
WHIPPLE MT. East from adit	(32,265) 18,352	81	10.9	880	8597
Adit	924			0	924
West from adit	13,913	81	7.7	627	6964
Winston Bros. IRON MT. East from shaft	(39,759) 9844	72	5.1	369	4020
Shaft	165			0	165
West from shaft	13,743	72	9.8	704	7948
Utah Constr. Co. IRON MT. West Portal	16,172	63	8.2	518	10,795
Winston Bros. COXCOMB East Portion	(17,795) 8765	18	7.7	139	8765
West Portion	9030	52	9.0	466	466
Broderick & Gordon EAST EAGLE MT. West Portal	(9,442) 9442	78	7.2	559	2709
WEST EAGLE MT. East from adit	(26,494) 7871	78	8.3	648	4785
Adit	2008			0	2008
West from adit	7974	78	7.7	603	4290
Dixon & Bent WEST EAGLE MT. West Portal	10,649	80	6.4	508	7979
Hunkin & Conkey HAYFIELD, No. 1 East from adit	(9677) 5317	69	5.8	400	4264
Adit	511			0	511
West from adit	4360	69	6.1	424	3995
Shofner & Gordon HAYFIELD, No. 2 West Portal	(5435) 5435	52	8.6	449	4877
J. F. Shea Co. COTTONWOOD East Portal	(20,105) 10,114	36		9.8	353
West Portal	9991	36		11.4	410
Morrison-Knudsen MECCA PASS No. 1, West Portal	(5,940) 338				
No. 2, West Portal	997				
No. 3, East Portal	4605				
West Constr. Co. WHITEWATER No. 1, West Portal	(10,232) 2060	69	7.4	514	1700
No. 2, East Portal	8172				8172
Wenzel & Henoch SAN JACINTO East from Cabazon	(67,415) 8553	85	0.2	21	1705
Cabazon shaft	246			0	246
Cross drift	935			0	935
West from Cabazon	22,839	77	1.6	127	4874
East from Potrero	20,589			0	160
Potrero shaft	796			0	796
West from Potrero	6712	3	4.3	13	447
West Portal	8722	80	3.1	249	4114
Hamilton & Gleason BERNASCONI East Portal	(6220) 6220	53	4.1	215	5804
Dravo Contr. Co. VALVERDE East from Shaft 1	(38,765) 2140				
Shaft 1	64			0	2140
West from Shaft 1	1525			0	64
East from Shaft 2	5400			0	2265
Shaft 2	204			0	4660
West from Shaft 2	5400	82	4.3	351	204
East from Shaft 3	6950			382	6306
Shaft 3	192	78	4.9	0	3422
West from Shaft 3	6950	78	3.9	302	192
East from Adit	5117	79	1.6	125	342
Adit	391			0	391
West from Adit	5283	79	1.5	119	331
Total Excav. Contract Tunnels exclusive of Adits and Shafts (In Miles)	307,410 58.22	1914	6.3	12,115 2.29	176,434 33.42
TUNNELS ON FORCE ACCOUNT					
EAST COACHELLA TUNNEL	Sched.	(96,605)			
Yellow Canyon Adit	1	686	78	9.4	0
East from adit	1	10,204	78	9.1	732
West from adit	1	10,076			9572
Fargo Canyon Adit	2	891	78	8.4	0
East from adit	2	11,850	78	6.4	657
West from adit	2	15,200			8657
Berdo Canyon Adit	3	2042	78	8.3	0
East from adit	3	15,824	78	9.5	649
West from adit	3	12,456			9591
Pushawalla Canyon Adit	4	2935	78	8.9	0
East from adit	4	10,186	78	8.8	691
West from adit	4	10,809			7699
WEST COACHELLA TUNNELS		(81,454)			
THOUSAND PALMS No. 1, West Portal	5	16,058	78	6.4	501
No. 2, Tunnel	5	3838			0
WIDE CANYON No. 1, E. Portal	Sched. 5	5122	78	6.4	502
No. 1, W. Portal	6	9183	78	5.5	428
No. 2 Tunnel		848			0
SEVEN PALMS E. Portal	(16,730) 8390				0
W. Portal	6 7	8340	78	10.3	807
LONG CANYON E. Portal	(15,295) 8360	78	10.2	796	5349
W. Portal	8	6935			0
BLIND CANYON E. Portal	(6848) —				0
W. Portal	8 8	6848	78	10.1	685
MORONGO No. 1 E. Portal	(5712) 5712	78	9.0	705	4368
W. Portal	8 8	—			0
MORONGO No. 2 E. Portal	(1820) 1820				0
W. Portal	8 8	—			0
Total excav. Force Acct. Tunnels excl. of Adits and Shafts (In Miles)		178,059 33.72	1170	8.4	9785 1.85
Total Tunnel Excavation (Miles)		91.94		7.1 ft.	4.14

Heading excavation is counted as two-thirds of full tunnel excavation. Adits and Shafts progress is not included in total footage.

NEWS FROM FIELD AND OFFICE

Appellate Court Judges Barhart, Janings, and Marks were recent visitors on the Dravo Contracting Company's Valverde tunnel job.

* * *

Magnus Hjalmarsen, engineer, and Maynard Anderson, inspector, were transferred, effective the first of the year, from Division 4 to Division 2.

* * *

Walsh Construction Company crews wound up the old year in a blaze of glory by holing through two tunnels in eight days. Colorado River tunnel, 5,514 feet in length, was driven through at 11:55 p. m. on the evening of December 22. It is the most easterly of all the 29 aqueduct bores. On the 11,580-foot Copper Basin tunnel No. 2 excavation was completed at 7:04 a. m., December 30. Since the 752-foot Copper Basin tunnel No. 1 was holed through months ago, only one of four bores held under the Walsh contract remains to be finished as far as excavation is concerned. It is the Whipple Mountain bore, 32,265 feet long, which is being driven from an adit and is nearly half excavated.

* * *

A compilation of transfers prepared this week by the District's personnel office reveals the following recent shifts: from Los Angeles F. N. Cronholm was transferred to Wide Canyon as superintendent of the aggregate plant; from Distribution Assistant Engineer D. W. Kemp and Draftsman R. A. Purchase were transferred to Electrical-Mechanical; from the Banning office Instrumentman Thomas W. Lean was transferred to Division 2; Chainman T. J. Cain, Rodman Walter S. Rudisill, Assistant Engineer J. C. Filer, Instrumentman Oran L. Pack, Inspector Irving Burdman, Inspector George M. Fox, and Inspector Charles K. Lewis, all were transferred to Divisions 5 and 6; Rodman Thomas E. Fogarty, Inspector A. S. Blake, and Instrumentman Oscar W. Carlson from Division 4 to Division 3; Engineer George E. Baker from Division 4 to Distribution; Junior Engineer G. A. Spassky from Division 4 to Hydrographic; Assistant Engineer L. H. Henderson from Division 4 to Banning; Assistant Engineer R. E. McGonagle and Junior Engineer John A. Blain from Division 4 to Division 5; Assistant Engineer W. G. Knox from Division 3 to the Safety Division; Assistant Engineer H. Norton Johnson from Division 2 to Safety.

AQUEDUCT TEMPERATURES

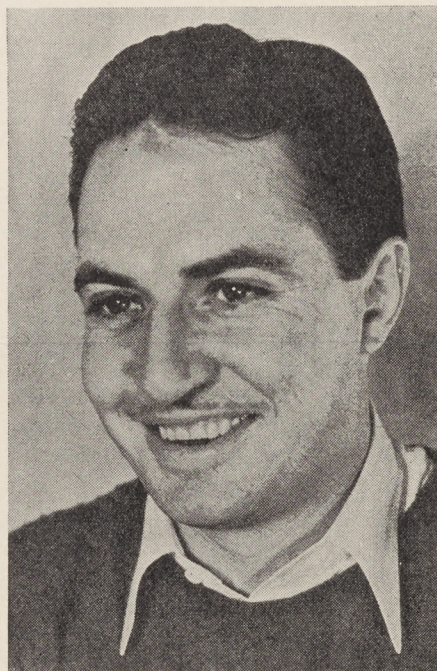
Dec. 15 to Dec. 31, Inclusive

	Max.	Min.
Div. 1	72°	36°
Divs. 2 and 3	75°	36°
Div. 4	76°	43°
Divs. 5 and 6	80°	28°

Harold P. Jacobs, transportation foreman at the Indio warehouse, and his bride have returned from their honeymoon spent on the coast. Mrs. Jacobs formerly was Bonnie Ashmore. The newlyweds are living on Marshall street in Indio.

* * *

Work is under way at Dixon & Bent's Eagle Mountain camp on a new dormitory building and cook house to replace the ones destroyed by a fire which broke out on December 22. Cause of the conflagration was believed to be a leaking oil drum.



Del Laneville, Jr., didn't come to California in a covered wagon, but he's a pioneer just the same. Del has been connected with Colorado River Aqueduct clerical forces since practically prehistoric times—since 1926, when the project consisted largely of a hope, a few transits, and a couple of Ford station wagons. He's at Banning now.

Edwin C. Hill, nationally famous commentator, told his radio network audience last week of the dramatic phases of Southern California's struggle for water, dealing particularly with the construction of the Colorado River Aqueduct.

* * *

Open house was held December 22 by Purchasing Agent S. A. Joseph and members of his staff on the fifth floor of the Los Angeles headquarters building. The scores of employees who attended voted the affair to be one of the bigger and better Christmas ideas of the year.

* * *

Sealed proposals for construction of approximately 16.3 miles of patrol road, and approximately 1.4 miles of adjacent stub roads along the proposed route of the 230 kv transmission line will be received at District headquarters on January 28, it was announced this week. The new road will extend in a north-westerly direction through the Whipple Mountains, near the Colorado River, and constitutes the first actual piece of construction to be launched in connection with the Boulder Dam power line.

* * *

District officials have been notified of the fact that Hanrahan Company, Youdall Construction Company, Elliott, Stroud Brothers & Seabrook, Charles Harlowe, Jr., and C. M. Elliott, who were awarded a contract under Specifications No. 70, will operate under the name of the Aqueduct Construction Company, with offices in the Rives-Strong Building, Los Angeles.

* * *

It only goes to prove that first appearances are deceiving. After withstanding the wiles of the feminine employees of the Los Angeles office for lo these many months, W. (Bill to you) O'Brien, cherubic faced member of the Mails and Files section, has acquired the reputation of a man who has his mind set on the higher things of life. Now comes the startling disclosure that Bill has been living a double life. It was brought to light when one of Don Juan O'Breeyon's fair admirers phoned the office begging him to go to the Ambassador on New Year's eve as her guest. The Don's personal appeal can be rated in the four-star class when it is considered that the cost to the young lady was ten bucks per plate—cash on the line, not including extras.

Siphon, Conduit and Canal Work Goes Forward

Work on aqueduct canal, conduit, and siphon construction continued to gather momentum last week as contractors pressed forward into the first stages of their sections of the job.

Barrett & Hilp and Macco Corporation continued to operate a scarifier and three caterpillar-carryall units for two shifts a day. The materials encountered have been sand and angular gravel mixed with clay or cemented. The ground is fairly tight in its present dry condition.

On Schedule 5, held by Jahn & Bressi, rough excavation has been 90 per cent completed for a distance of 580 feet, and rough excavation 25 per cent completed for a distance of 295 feet. On Schedule 5A, rough excavation has been 25 per cent finished for a distance of 80 feet.

Clyde Wood & M. J. Bevanda are 90 per cent completed with rough excavation for a distance of 2,545 feet, while Utah Construction Company crews are from 15 to 45 per cent completed with rough excavation for 2,540 feet.

The Aqueduct Construction Company (the new name for Hanrahan et al) started its camp construction on December 21, and is scheduled to start excavation within a few days.

Crews of Three Companies, Inc., are continuing with the job of erecting a 100-ton Bucyrus Monagan dragline. Pacific System Homes, Inc., is still at work on the building of a camp for the Thompson-Starrett Company.

Meanwhile plans are being made for the opening of bids January 7 on the building of the Big Morongo and San Andreas siphons, which include 1.86 miles of aqueduct construction.

The Big Morongo siphon will be located near the west portal of Morongo tunnel No. 2, most westerly of the bores on the Coachella Division of the aqueduct. The San Andreas structure will be built a short distance east of White-water tunnel No. 1.

The specifications provide alternative bids on pre-cast concrete, monolithic concrete, or steel construction. The two siphons were included in the work on which bids were received October 31. New bids were called on these units so that tenders could be obtained on an alternative type of articulated poured-in-place construction not previously provided.

CLEO'S BARGE AIDS CHECKING TUNNEL FOR "A" LINE CLEARANCE ON DIV. 6

(See Front Cover.)

On a recent visit to the Bernasconi tunnel, Bill Fox, the well-known aqueduct lens and flash bulb artist, discovered, or rather uncovered, a strange device operating therein.

At first inspection, Mr. Fox decided that Prof. Lucifer G. Butts had gotten his fertile brain into "high" again and had brought forth a masterpiece. After lurking in a sump-hole for several hours he managed to get a close-up of this strange device being operated by what appeared to be a crew of tired-looking S. I.'s.

Junior Jumbo

By fraternizing with the crew, Mr. Fox was able to glean a few facts concerning the Junior Jumbo or "Cleo's Barge" as some local wag had labeled it.

The Junior Jumbo, as explained by E. L. Cranford, the inventor-operator, was built to facilitate the checking of tunnel for "A" line clearance. The major part of "Cleo's Barge" consists of a light tram-car that can be lifted aside by two husky chainmen to permit the passage of regular tunnel traffic. Mounted on the front of this car is a swinging arm supporting a revolving sleeve which can be set accurately on the tunnel axis by means of a light ray emanating from a reflector on an adjustable rod and

shining through a peep-hole on a similar rod, both of which are suspended from roof spads. The roof "A" line is determined by graduated rods with shortage reading direct at the tunnel axis. The wall "A" line is determined by rods graduated to show horizontal offset at markers placed at one-foot intervals on a plumb line suspended from the sleeve at the tunnel axis.

The flexibility of the device permits accurate results even when working from tracks of indefinite line and grade, or from passing tracks.

65% Saving

The proud—but modest—inventor claims that the Junior Jumbo has been used in portions of the Valverde Tunnel at a saving of approximately 65% of the cost of locating and marking tight spots, by other methods.

Mr. Cranford, better known as "Jerry," formerly of the Stone & Webster Engineering Corp., joined the Geodetic Division of the Metropolitan Water District in February, 1933, and in June of 1934 was transferred to the staff of O. J. Schieber, resident engineer of Division 6 at Valverde. In the cover picture he is shown in action on the "bridge" of the "barge." Other members of the crew are D. A. Loucks, A. C. Wallen and G. E. Bowler.

FOUR DISTRIBUTION TUNNELS AWARDED

West Construction Company and the firm of L. E. Dixon, Bent Brothers, and Johnson were awarded contracts last week for the construction of Monrovia Tunnels Nos. 1, 2 and 3, and the Pasadena tunnel of the aqueduct distribution system.

The West contract was for the Monrovia tunnels—\$502,700 for No. 1 and No. 2, and \$1,688,200 for No. 3. Dixon-Bent-Johnson will drive the Pasadena bore, the contract price being \$621,180.

The new awards involve approximately 10 miles of tunnel construction. All of the bores will be circular and 10 feet in diameter. Water will flow through them under pressure.

Longest of the four tunnels will be Monrovia No. 3, approximately six miles in length. It will be driven from its west portal and from a horizontal adit in Fish Canyon.

Most interesting of the four to urbanites, however, will be the Pasadena tun-

nel. This bore will be driven under a densely populated section of the city of Pasadena. It will extend under Mountain street, from Hill avenue to Sunset avenue, and then beneath privately owned lands and cross streets to a portal in the Arroyo Seco.

The Monrovia tunnels will link the aqueduct distribution system with Pine Canyon reservoir above Morris Dam, which structure will become a part of the aqueduct system upon completion of the project.

The four bores constitute the first step in the construction of the 144-mile distribution system which will pick up Colorado River water from Cajalco reservoir, at the end of the main aqueduct, and deliver it to the thirteen cities which form the Metropolitan Water District. The four new tunnels, as well as the entire distribution system, will be carried forward under the direction of R. B. Diemer, distribution engineer of the District.